National Aeronautics and Space Administration

Weather and Atmospheric Dynamics Focus Area (WADFA) Strategy Development Working Group Overview

Tsengdar Lee

Gail Skofronick-Jackson

Aaron Piña

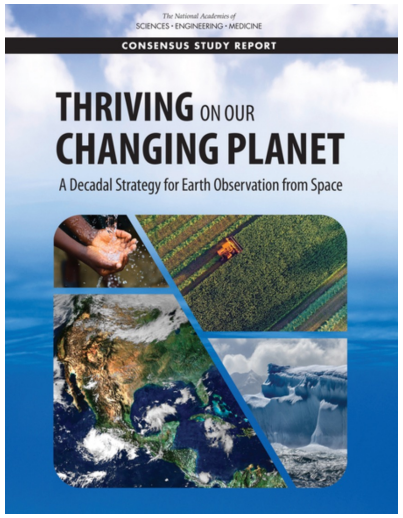
hq-wadfa-2020rfi@mail.nasa.gov

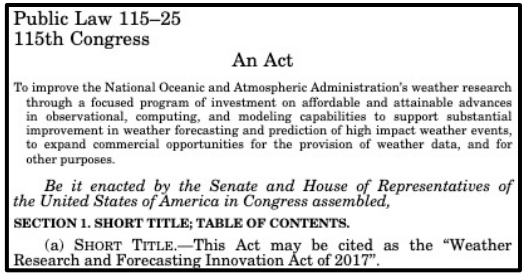
July 13, 2021

Purpose

NASA civil servants will co-develop a strategy based on the other strategy plans that will prioritize and guide WADFA research investments

Guiding documents:





Public Law 115–25
115th Congress

An Act

To improve the National Oceanic and Atmospheric Administration's weather research through a focused program of investment on affordable and attainable advances in observational, computing, and modeling capabilities to support substantial improvement in weather forecasting and prediction of high impact weather events, to expand commercial opportunities for the provision of weather data, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE; TABLE OF CONTENTS.

(a) SHORT TITLE.—This Act may be cited as the "Weather Research and Forecasting Innovation Act of 2017".

OSTP FTAC: Predictability and prediction especially for extreme hydrological events

Schedule:

0 What is WADFA now?

May '20 – Feb '21	Feb '20 – Jun '21	Jul '21	Fall '21
RFI to WADFA R&D community			
	Synthesis of RFIs 1		
		WADFA R&D community workshop 2	
		SDWG synthesis and prioritization 3	
			WADFA strategy roll-out

Listening Session Community Workshop TODAY!

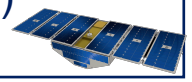
What's special or different in WADFA?

- Unlike other focus areas, WADFA is small in terms of people and budget but large when considering the amount of leverage.
  - WADFA does not engage in weather forecast services and operations that NOAA provides, but WADFA's research and observations contributes to national capabilities and R&D agendas.
  - Partnerships are important to WADFA, especially in modeling, data assimilation, field campaigns, and transition to operation.
- WADFA has many relationships with other ESD focus areas, programs, interagency, and international partners.
  - Atmospheric sounders are heavily utilized by the Atmospheric Composition and Climate Variability and Change focus areas and applications development
  - WADFA's precipitation measurements are utilized by the Water and Energy Cycle focus area.
  - The Physical Ocean program's SSH and SST products are heavily used for atmospheric modeling and weather forecasting, especially on subseasonal to seasonal predictions
  - WADFA heavily leverages the Modeling, Analysis, and Prediction program's model and data assimilation system development
- WADFA is facing a fast-changing environment
  - New generation of operational satellites and commercial small satellites
  - New models
  - AI/ML

WADFA Current Activities

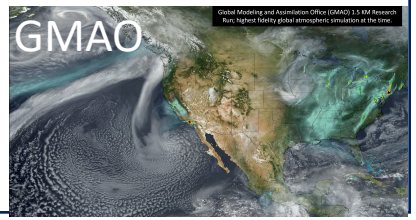
Flight (including Data Systems)

- Operating Missions: GPM, CYGNSS, Aqua (AIRS), LIS on ISS, RainCube, TEMPEST-D
- Future Missions: TROPICS, ACCP, PBL
- GPM's Precipitation Processing (data) System



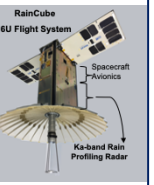
Interagency and International Interfaces

- ICAMS (previously OFCM)
- JCSDA
- ECMWF, ESA, JAXA
- CEOS, CGMS, GEO
- NOAA, DOE (ARM)



Earth Science Technology Office

- In-space Validation of Earth Science Tech.
- Instrument Incubator Program
- Advanced Information Systems Tech: data systems, new observing strategy, and AI/ML
- Develops and demonstrates weather related technologies for future satellite and airborne missions



WADFA

Research & Analysis

- ROSES Research solicitations
- Modeling, Analysis, and Prediction (MAP) Program
- High-end Computing
- Field Campaigns: validation, process obs.
- Intra-R&A connections, mainly:
  - Atmospheric Composition
  - Water and Energy Cycle
  - Physical Oceanography

Core Facility Assets

- MSFC/SPoRT
- GSFC/GMAO and NCCS
- Instrument Assets

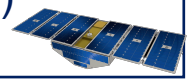
Applied Sciences Program (ASP)

- SPoRT is heavily leveraged by the ASP's Disasters Area
- Exploring collaboration with ASP's Food Security and Agriculture Area
- Disaster Rapid Response
- ROSES and Flight funded activities

WADFA Current Activities

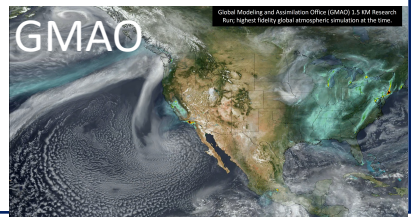
Flight (including Data Systems)

- Operating Missions: GPM, CYGNSS, Aqua (AIRS), LIS on ISS, RainCube, TEMPEST-D
- Future Missions: TROPICS, ACCP, PBL
- GPM's Precipitation Processing (data) System

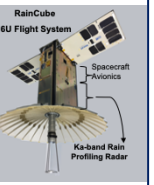


Interagency and International Interfaces

- ICAMS (previously OFCM)
- JCSDA
- ECMWF, ESA, JAXA
- CEOS, CGMS, GEO
- NOAA, DOE (ARM)



Earth Science Technology Office



- In-space Validation of Earth Science Tech.
- Instrument Incubator Program
- Advanced Information Systems Tech: data systems, new observing strategy, and AI/ML
- Develops and demonstrates weather related technologies for future satellite and airborne missions

Areas of WADFA Discretionary funding

WADFA

Research & Analysis

- ROSES Research solicitations
- Modeling, Analysis, and Prediction (MAP) Program
- High-end Computing
- Field Campaigns: validation, process obs.
- Intra-R&A connections, mainly:
  - Atmospheric Composition
  - Water and Energy Cycle
  - Physical Oceanography

Core Facility Assets

- MSFC/SPoRT
- GSFC/GMAO and NCCS
- Instrument Assets

Applied Sciences Program (ASP)

- SPoRT is heavily leveraged by the ASP's Disasters Area
- Exploring collaboration with ASP's Food Security and Agriculture Area
- Disaster Rapid Response
- ROSES and Flight funded activities

WADFA R&A ROSES Solicitations

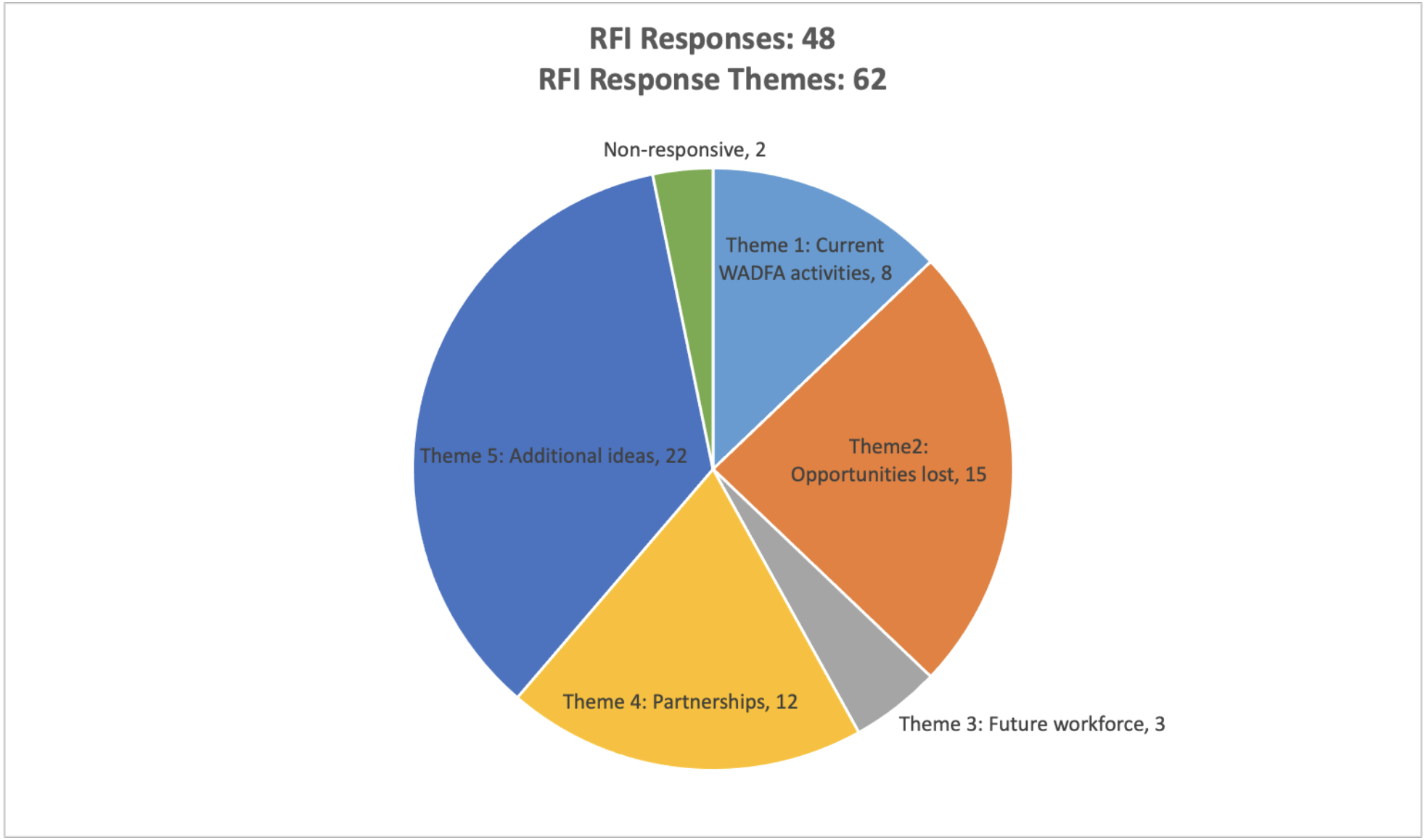
ROSES Year	Solicitation Short Title	# Proposed	# Selected	1-Year $	# Yrs of $
2017	TASNPP: Terra, Aqua, Suomi, NPP (WADFA only)	230 all topics	67 (11 WADFA)	$2.45M (WADFA)	3
2017	CYGNSS Science Team	43	14	$2.1M	3
2018	Precipitation Measurement Missions	130	40	$5.17M	3
2019	Interdisciplinary Science (WADFA only) Urban Hydrometeorology Life Cycle of Snow	 27 25	 4 7	 $2.0M $2.23M	3
2019	Weather and Atmospheric Dynamics	85	20	$2.5M	3
2019	PBL Incubation Study Team	44	14	$1.5M	1
2019	Earth Science Research from Operational Geostationary Satellite Systems (Joint w/ NOAA NESDIS)	152	NASA: 9, NOAA: 18	NASA: $1.9M, NOAA: $3.2M	3
2019	GNSS (WADFA only: Radio Occultations)	8	4	$900K	3
2019	Remote Sensing Theory (WADFA only)	59	11	$1.0M	4
2020	Rapid Response and Novel Research in Earth Science-COVID (WADFA only)	10	2	$200K	1
2020	New Investigator Program (NIP) WADFA only	33	5	$1M	3
2020	CYGNSS Science Team	46	14	$2.5M	3
2021	FINESST (WADFA only)	27	6	$270K	3
2021	Precipitation Measurement Missions (received June)	114	TBD	$5M	3

WADFA R&A ISFM/WP/Directed Funding

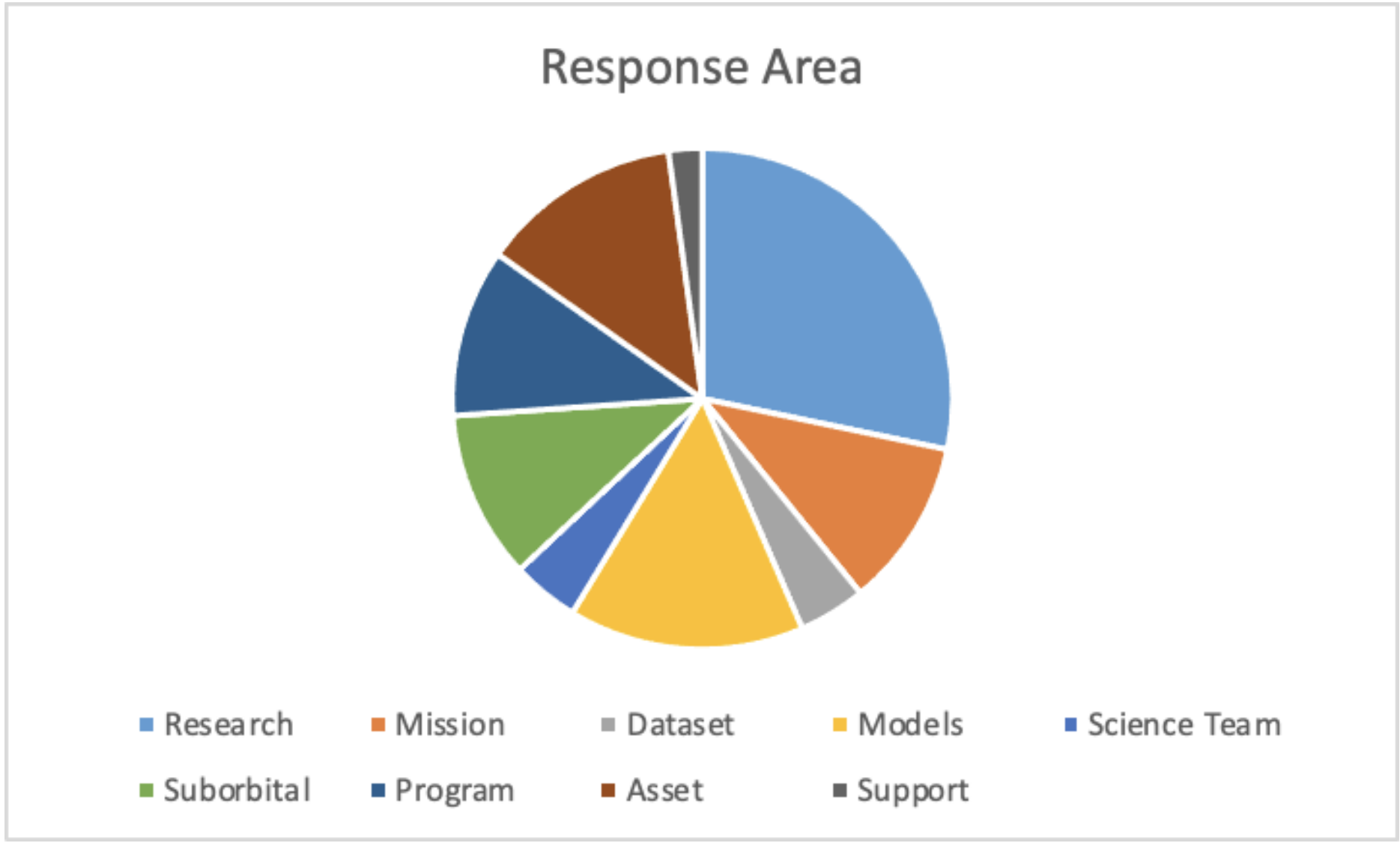
ISFM Title	Center	# PI teams
GPM Algorithms (R&A, S-Jackson)	GSFC	6
GPM Validation (R&A, S-Jackson)	MSFC	2
Lightning Science (R&A, S-Jackson)	MSFC	1
CYGNSS Science (R&A, S-Jackson)	MSFC	1
DAWN Instrument Support (R&A, S-Jackson)	LaRC	1
Climate Impacts (R&A, Lee)	GISS	1
SPoRT ISFM (R&A, Lee)	MSFC	1
NASA Earth Exchange ISFM (R&A, ASP, ESDIS, Scientific Computing, AIST, Lee)	ARC	1
Direct Readout Laboratory (R&A, Lee)	GSFC	1
JCSDA (R&A, Lee)	GSFC	1
GNSS-RO/COSMIC (R&A and IDS, Kaye)	JPL&NCAR	2
HALO Instrument Support (R&A, Kaye)	LaRC	1

Plus SPIRE Data Buy

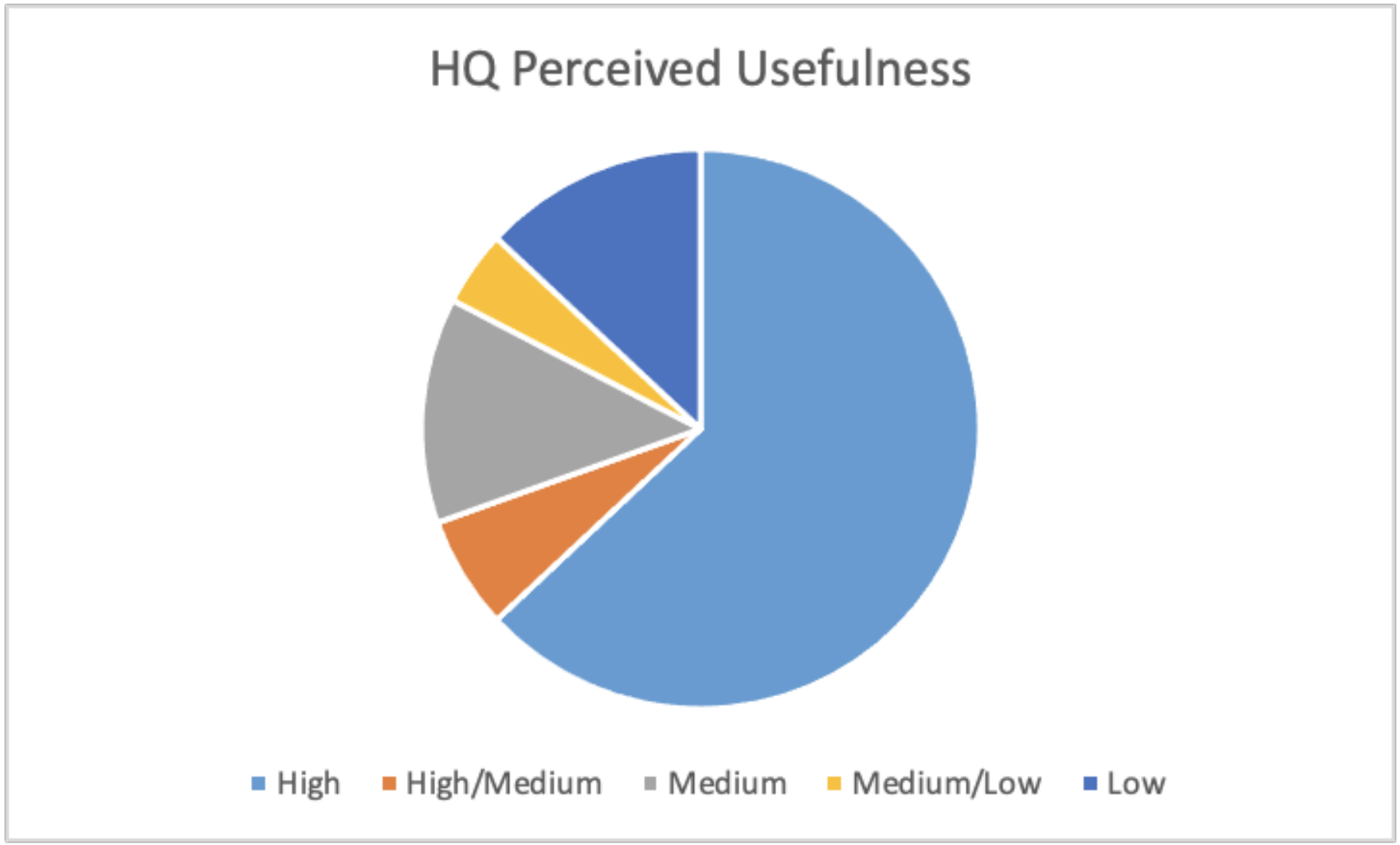
RFI Responses Summary



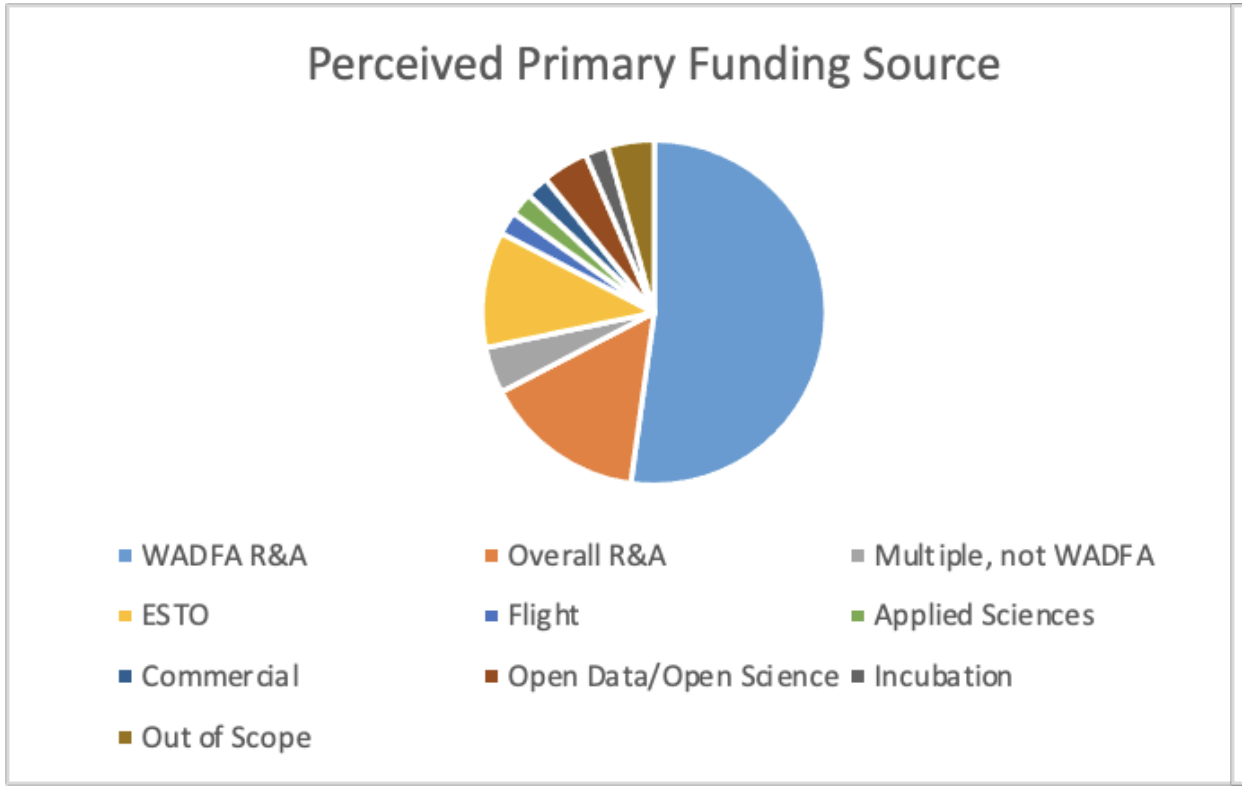
RFI Responses Summary

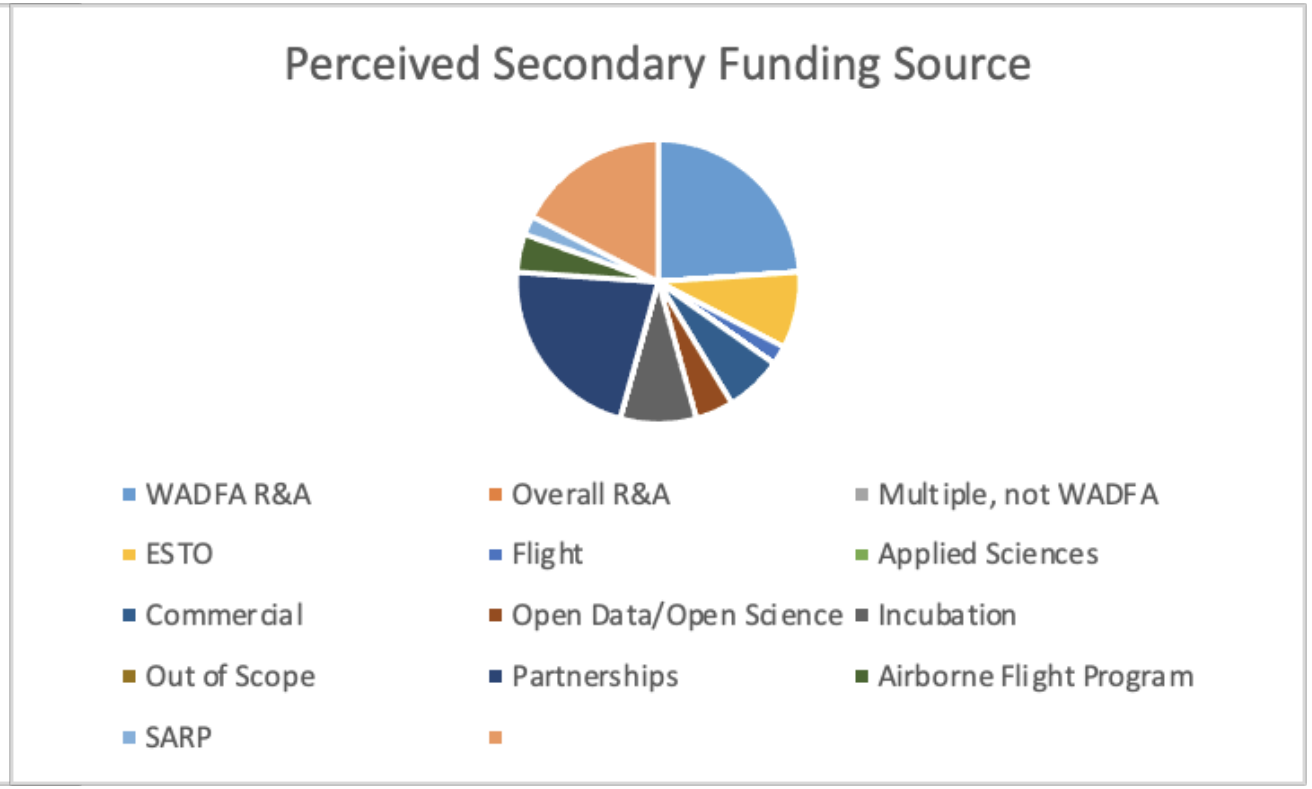


RFI Responses Summary



RFI Responses Summary





Community Listening Workshop Session - Agenda

Time (EDT)	Duration (minutes)	Title/topic	Who	Institution
Tuesday - July 13, 2021				
Session 1: NASA WADFA Overview				
11:00	10	Opening remarks	Tsengdar Lee	NASA HQ
11:10	20	Overview of ESD R&A	Jack Kaye	NASA HQ
11:30	15	Overview of WADFA Strategy	Gail	NASA HQ
11:45	15	Open questions to NASA HQ	All	
12:00	15	BREAK	BREAK	
Session 2: Updates on WADFA's Existing Programs				
12:15	20	GMAO	Steven Pawson	NASA GSFC/GMAO
12:35	20	SPoRT	Chris Hain	NASA MSFC
12:55	20	Sounders	Chris Barnett, Joao Teixeira, Vivienne Payne, Larabee Strow	JPL
13:15	5	BREAK		
13:20	20	GNSS-RO	Chi Ao	JPL
13:40	20	A-CCP	Sue van den HeeverScott Braun	Colorado St UNASA GSFC
14:00	20	PBL	Joao Teixeira	JPL
14:20	30	BREAK		
Session 3: WADFA RFI Responses				
14:50	10	NASA's Critical and Impactful Role in Subseasonal to Seasonal Forecasting Research and Research to Operations Paradigm.	Duane Waliser	JPL
15:00	10	Summary of Modeling Inputs for WADFA from NASA GSFC, Mesoscale Atmospheric Processes Laboratory	Toshi Matsui	NASA GSFC
15:10	15	Capitalizing on Public-Private Partnerships for Sustained Earth Observations & WADFA Process-Related Science Investigations	Joe Turk	JPL
15:25	10	Atmospheric Predictability Research under WADFA	Xubin Zeng	U of AZ
15:35	5	BREAK		
15:40	10	Concept: Leveraging NASAs Unique Suite of Ground Based Networks to Improve Weather Research, Observations, and Data Assimilation as they Relate to Training our Future Interdisciplinary and Diverse Workforce	John Sullivan	NASA GSFC
15:50	10	Subpolar Climatology of Precipitation Microphysics and Dynamics	Mei Han	Morgan St U/NASA GSFC
16:00	10	Cloud and Precipitation Microphysics Interaction with Weather Systems: A Realm Waiting for Exploration	Jie Gong	USRA/NASA GSFC
16:10	10	Multiscale Interactions of Convective Storms with Large-scale Environment	Hui Su	JPL
16:20	10	BREAK		
Session 4: Discussion				
16:30	30	Open discussion	All	
17:00		ADJOURN		

WADFA Self Assessments & Future Plan

Strengths:

- Missions and instruments
- Strong science
- Societal benefits (such as contribution to weather forecast operations and disasters management)

Weaknesses:

- Multiplicity of partners and the challenge to coordinate with those partners

Opportunities:

- Decadal Survey (ACCP, PBL, Winds Observables)
- Enhanced interest in Supercomputing, Machine Learning, and Artificial Intelligence
- Ability to shape NASA's weather programs in, for example, hyperspectral IR and MW sounders as well as GNSS-RO
- Better leveraging of NASA and non-NASA assets and programs

Challenges

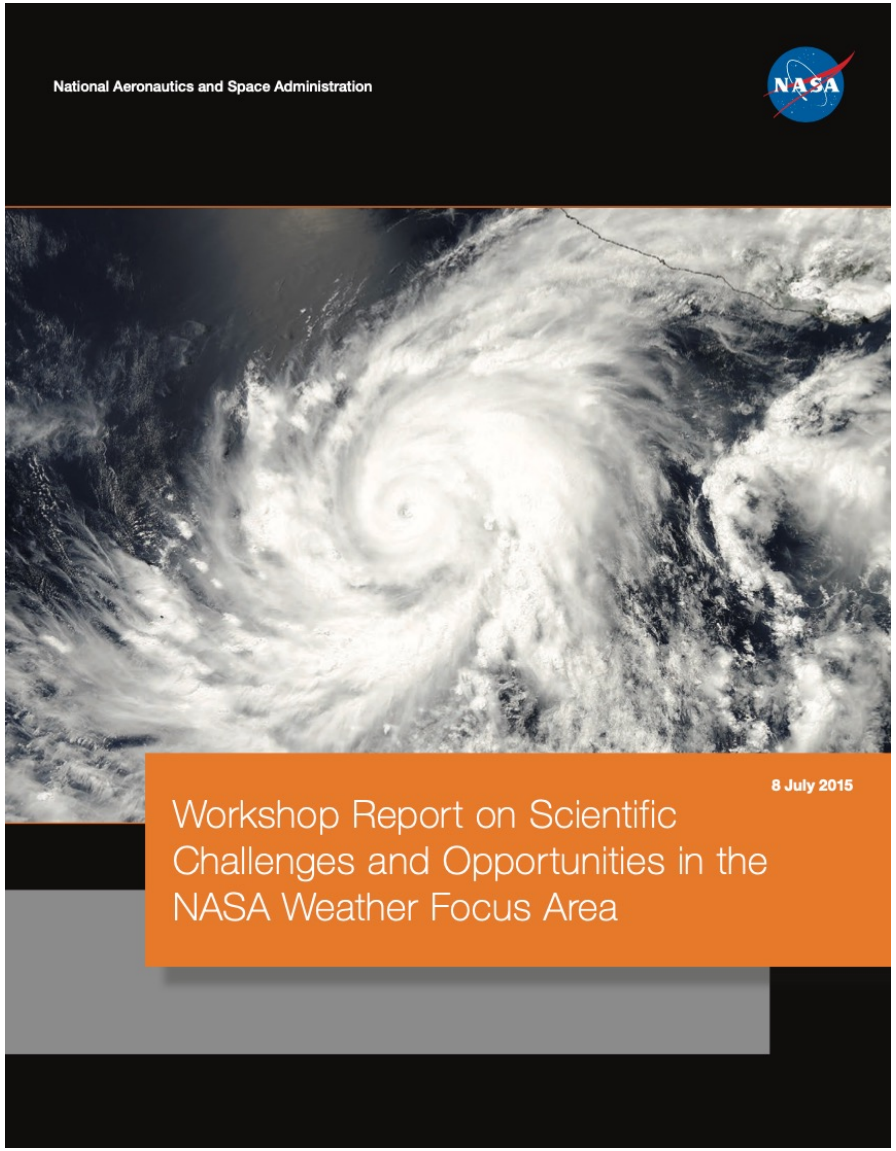
- Adopting new observation platforms at other agencies and commercial sectors
- Managing changing modeling and computing environments and the recruitment and retention of workforce
- Meeting multiple community interests in many different areas
- Maintaining NASA's capabilities while being replaced by operational capabilities (transition is a double-edged sword)

The Future

- Support the 2017 Decadal Survey through the ACCP Designated Observable, the PBL Incubation Study, and 3D Winds
- Update and implement the WAD Strategic Plan accordingly
- Continue to oversee and fund high quality science investigations

2015 WADFA Workshop

Influenced the 2017 Decadal Survey



Strategy Development Working Group

Government Civil Servants to assist in developing the WADFA Strategic Plan:

Name	Center
Rei Ueyama	NASA ARC
George Huffman	NASA GSFC
Will McCarty	NASA GSFC
Amber Emory	NASA HQ/ESTO
Amin Nehrir	NASA LaRC
Bill Smith	NASA LaRC
Emily Berndt	NASA MSFC
Chris Schultz	NASA MSFC

By July 30, 2021, please contact Tsengdar, Aaron, or Gail if you have additional comments beyond this Listening Session.

Expected outcomes of the SDWG

Co-develop a strategy that will prioritize and guide WADFA research investments for the next 5-10 years**

- Individually prioritize responses from the WADFA RFI
- Review current WADFA activities
- Collectively identify higher-priority activities and opportunities noted from RFIs, current WADFA activities and from individual experiences with NASA
  - How can we better align ROSES solicitations with WADFA community needs.
    - With understanding that funding levels are not expected to be increased
    - With understanding that priority areas listed in WADFA strategic plan may influence non-WADFA funding selections in Applied Sciences, Earth Science Technology Office, Earth Science Data Systems
- Example areas:
  - 2017 Decadal Survey and preparing for the next Decadal Survey
    - A-CCP
    - PBL
    - Atmospheric Winds
  - Current missions (e.g., Sounders, PMM, CYGNSS)
  - Future opportunities
    - Enabling technologies (e.g., GNSS-RO, computing advances)
    - Inter-ESD, interagency, and international engagements
  - Future workforce

** this strategy is not expected to be as detailed as the 2015 WADFA Workshop Report

Contact Information

Tsengdar Lee: tsengdar.j.lee@nasa.gov

Gail Skofronick-Jackson: gail.s.jackson@nasa.gov

Aaron Piña: aaron.pina@nasa.gov

To all of us: hq-wadfa-2020rfi@mail.nasa.gov

By July 30, 2021, please contact Tsengdar, Aaron, or Gail if you have additional comments beyond this Listening Session.